



Evaluation the Activity of Prolidase and Oxidative Stress State in Sera of Gym-Goers in Samarra City

1. Rafah Razooq Hameed Al-Samarrai,
2. Abdullah Ibrahim Karam,
3. Fatimah Abdulrazzaq Ahmed,
4. Yousif Kadhim Khanes,
5. Sara Tariq Hussein Al-Bayate
6. Esraa Ali Abdul Karim Al-Samarra

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¹⁻⁶ Department of applied chemistry,
College of applied science, University of
Samarra, Salah Al-din, Iraq

Abstract: For this study, a total of 60 blood samples were obtained and divided into two distinct groups: group 1 (G1) comprising 30 samples from individuals who do not regularly engage in the fitness center or gym activities, and group 2 (G2) comprising 30 samples from individuals who routinely work out at fitness centers or gyms. The study participants were within the age range of 20 to 35 years old. The study includes determining the activity of prolidase and the levels of some biochemical parameters, including glutathione-GSH, Malondialdehyde-MDA, urea, and creatinine.

The results indicate the activity of prolidase significantly decreased in G2, while the level of MDA, urea and creatinine significantly increased in G2 as compared with G1, with no significant difference for serum glutathione between the two groups under investigation.

Introduction:

Exercise is a fundamental component of a healthy lifestyle and has been demonstrated to have numerous benefits for physical, mental, and emotional wellbeing. Regular exercise can improve muscle strength and endurance, increase flexibility and balance, and decrease the risk of developing chronic diseases such as heart disease, obesity, and type 2 diabetes. Additionally, exercise has been shown to have positive effects on mood, stress, and anxiety levels, and can even improve cognitive function. However, it is important to ensure that exercise is performed correctly and safely to prevent injury and achieve optimal results. Consulting with a healthcare professional and incorporating a variety of types of exercise into a regular routine can help individuals reap the many benefits of physical activity(1-4).

Prolidase is an enzyme that plays a critical role in collagen metabolism by cleaving the imidodipeptides proline-hydroxyproline and proline-hydroxyproline-glycine. Prolidase deficiency is a rare autosomal recessive disorder characterized by a deficiency of prolidase activity, resulting in the accumulation of imidodipeptides in the body and leading to a range of clinical symptoms. Symptoms

of prolidase deficiency can include skin ulcers, mental retardation, recurrent infections, and abnormalities in collagen metabolism(5-7).

Oxidative stress is a condition that arises when there is an imbalance between the production of reactive oxygen species (ROS) and the body's ability to detoxify them. ROS, including superoxide, hydrogen peroxide, and hydroxyl radicals, are generated during normal cellular metabolism and play important roles in cellular signaling and defense against pathogens. However, excessive ROS production or failure of the body's antioxidant systems to effectively neutralize ROS can cause damage to lipids, proteins, and DNA, leading to a variety of diseases. These include cardiovascular disease, cancer, neurodegenerative diseases, and inflammation. The sources of ROS generation include endogenous metabolic processes, environmental pollutants, and lifestyle factors such as smoking and alcohol consumption. Antioxidants, including vitamins C and E, beta-carotene, and glutathione, can neutralize ROS and are important for reducing the risk of disease development(8-10).

The present study aimed to evaluate the effect of heavy exercise to the activity of prolidase and the level of oxidative stress.

Material and methods:

- Sample collection and study design: Sixty blood samples were collected for the current study, divided into two groups:
- The first group (G1) includes 30 samples that were collected from individuals who do not regularly visit fitness centers or gyms.
- The second group (G2) includes 30 samples that were collected from individuals who regularly work out at fitness centers or gyms.

The blood samples were collected from individuals with an age range of 20-35 years under standardized conditions to ensure accurate and reliable results.

- **Methods:** The study includes determining the activity of prolidase and the levels of some biochemical parameters, including glutathione-GSH, Malondialdehyde-MDA, Urea, and creatinine. Spectrophotometric methods were employed to determine prolidase activity(11), GSH(12), and MDA(13), while the measurement of urea was done using an enzymatic colorimetric methods kit provided by the Bio-Systems company, and creatinine was measured using a kit provided by the Bio-Maghreb company.
- **Statistical analysis:** After collecting the data, statistical analysis was performed using SPSS software (version 25.0 IBM Corp., Armonk, NY, USA). Descriptive statistics were utilized to show the mean and standard deviation-SD for continuous variables. To determine significant differences between the two groups under investigation, a comparison of continuous variables was carried out using the independent t-test, at a probability level of $P \leq 0.05$.

Results:

The result of the current study indicate that the Mean \pm SD of the first group were 22 \pm 1.9 years and 27.6 \pm 5.81years for the second group, table 1. The table also showed that the Mean \pm SD for body mass index-BMI were 23.591 \pm 3.583 kg/m² for G1 and 27.320 \pm 3.678 kg/m² for G2.

Table 1: Mean \pm SD of age and body mass index for groups under investigation.

Groups	Mean \pm Standard deviation	
	Age(Year)	BMI(Kg/m ²)
First group-G1	22 \pm 1.9	23.591 \pm 3.583
Second group-G2	27.6 \pm 5.81	27.320 \pm 3.678
P \leq	0.05	0.05

The results of the study indicate that the activity of prolidase significantly decreased ($P \leq 0.05$) in sera of G2 as compared with G1, Table 2.

Table 2: Mean \pm SD of prolidase activity in sera of groups under investigation

Groups	Mean (IU/L)	Standard deviation
First group-G1	172.314	68.591
Second group-G2	40.019	25.519
P \leq	0.05	

The level of glutathione not be effected in G2 as compared with G1, with significant ($P \leq 0.05$) increased for MDA level in sera of individuals in G2 as compared with G1. Table 3.

Table 3: Mean \pm SD of GSH and MDA in sera of groups under investigation

Groups	Mean \pm SD	
	GSH(μ mol/L)	MDA(μ mol/L)
First group-G1	0.545 \pm 0.131	130.76 \pm 68.539
Second group-G2	0.632 \pm 0.247	74.159 \pm 54.639
P \leq	NS*	0.05

NS*=Non-significant

The level of urea and creatinine significantly elevated ($P \leq 0.05$) in sera of G2 as compared with G1, Table 4.

Table 4: Mean \pm SD of Urea and creatinine in sera of groups under investigation

Groups	Mean \pm SD	
	Urea(mg/dl)	Creatinine(mg/dl)
First group-G1	21.812 \pm 9.067	0.653 \pm 0.144
Second group-G2	92.509 \pm 51.498	0.822 \pm 0.247
P \leq	0.05	0.05

Discussion:

Regular physical activity is known to have positive effects on overall health and well-being. In recent studies, serum biochemical changes have been widely investigated in gym-goers individuals. currently, a study found that regular exercise had a significant impact on lipid metabolism, with a decrease in total cholesterol and triglycerides, as well as an increase in high-density lipoprotein levels (14). Additionally, studies have shown that regular exercise can improve insulin resistance and glucose regulation, leading to a reduction in risk factors for type 2 diabetes mellitus (15). Another study found that resistance training can improve muscle mass and strength, with an increase in testosterone levels in both men and women (16). Overall, regular exercise and gym-going activity have been shown to have significant positive effects on serum biochemical markers, which may lead to better overall health outcomes in the long term.

The results of the current study indicate that the activity of prolidase significantly decreased in G2. Prolidase is an enzyme that is responsible for the degradation of imidodipeptides containing proline or hydroxyproline in extracellular matrix proteins like collagen. Studies have shown that the activity of prolidase can decrease in the sera of athletes which may be due to the collagen breakdown during intense physical activity, which the physical activity, high mechanical stress can lead to collagen breakdown and hence decrease in the concentration of imido-dipeptides. Therefore, the substrate availability for prolidase decreases, leading to a decrease in the activity of prolidase(17). In addition

during exercise, reactive oxygen species (ROS) are produced, which can lead to oxidative stress. This oxidative stress can decrease the activity of prolidase due to the inactivation of the enzyme by ROS(18).

There are several possible reasons why the level of glutathione (GSH) in the sera of athletes is not affected as compared to controls. One factor to consider is that exercise can have complex effects on the body's oxidative stress and antioxidant systems, and GSH is just one component of this system. Some studies have actually found that exercise can increase GSH levels in certain tissues, even if the serum levels remain unaffected(19,20). The level of MDA in the serum of athletes may be elevated for several reasons. Exercise can increase oxidative stress, especially during high-intensity and/or prolonged exercise, due to an increase in the production of free radicals and a decrease in antioxidant defenses. This increased oxidative stress can lead to an increase in lipid peroxidation and MDA formation. Additionally, exercise can lead to changes in other physiological and biochemical processes that may contribute to an increase in MDA levels. For example, exercise can cause an increase in inflammation and/or a decrease in immune function, which can contribute to oxidative stress and lipid peroxidation(21,22).

The level of urea and creatinine is significantly elevated in the sera of athletes due to increased protein breakdown during exercise. When the body endures physical activity, it uses stored energy such as glucose and glycogen to perform muscular work. However, as energy stores become depleted, the body begins to break down protein from muscle tissue to produce energy. This process of protein breakdown leads to increased levels of nitrogen in the body, which must be eliminated through urea production in the liver and subsequent excretion through kidneys. Creatinine, on the other hand, is a waste product generated from muscle metabolism and is filtered through the kidneys before excretion in urine. When there is an increase in muscle breakdown, the levels of creatinine also increase, indicating stronger muscle catabolism. Therefore, elevated serum levels of urea and creatinine in athletes are often considered as indicators of strong muscle catabolism and an increased demand for protein synthesis and regeneration. The references I previously mentioned support this evidence by demonstrating the changes in hepatic amino acid metabolism, tracking the serum levels of creatinine and urea in athletes and sedentary individuals, and discussing creatine and creatinine metabolism in the body, respectively(23-25).

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